

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1, 4-7, 10, 11, 14-17, 20, 21, 24-27, and 30 are currently pending. Claims 3, 13, and 23 have been canceled without prejudice; and Claims 1, 4, 5, 11, 14, 15, 21, 24, and 25 have been amended by the present amendment. The changes to the claims are supported by the originally filed specification and do not add new matter.

In the outstanding Office Action, Claims 1, 3-7, 10, 11, 13-17, 20, 21, 23-27, and 30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,282,305 to Huo et al. (hereinafter “the ‘305 patent”) in view of U.S. Patent No. 5,671,294 to Rogers et al. (hereinafter “the ‘294 patent”).

Applicants wish to thank the Examiner for the interview granted Applicant’s representative on March 4, 2009, at which time a proposed amendment to the claims was discussed. At the conclusion of the interview, the Examiner indicated that the proposed amendments would likely overcome the outstanding rejection, but that a further search would be required.

Amended Claim 1 is directed to a method for computerized analysis of a mammogram in digital form of a breast of a patient, comprising: (1) extracting from a selected region of interest in the mammogram, plural surface areas or volumes calculated at corresponding plural scales associated with a texture of a parenchyma of the breast; (2) applying said plural surface areas or volumes directly as inputs to at least one of a linear discriminant classifier and an artificial neural network classifier; and (3) generating a risk marker indicative of a breast disease risk for said patient based on an output of the at least one of a linear discriminant classifier and an artificial neural network classifier. Claim 1 has been amended to include the limitations recited in Claim 3 and to clarify that the surface

areas of volumes are applied directly to a linear discriminant classifier or an artificial neural network classifier. The changes to Claim 1 are supported by the originally filed specification, and do not add new matter.¹

Regarding the rejection of Claim 1 under 35 U.S.C. § 103(a), the Office Action asserts that the '305 patent discloses everything in Claim 1 with the exception of "multiple scales,"² and relies on the '294 patent to remedy that deficiency.

Applicants respectfully submit that the rejection of Claim 1 is rendered moot by the present amendment to Claim 1. However, since Claim 1 has been amended at least to incorporate the limitations recited in Claim 3, Applicants will address the rejection as set forth in Claim 3.

The '305 patent is directed to a method for the computerized assessment of breast cancer risk, including the steps of obtaining a digital image of a breast of a person, determining values of parenchyma features of a breast region at a predetermined parenchymal location in the digital image, which includes determining the value of a skewness feature based on gray-level as to RAM analysis of pixels within the predetermined parenchymal location. Further, the '305 patent discloses that values of coarseness and contrast features, as well as a balance feature and a first moment of the power spectrum feature may be determined. Further, the '305 patent discloses that the method for computerized assessment of breast cancer risk includes the step of comparing the values of the determined features with a predetermined model associating values of the features with a respective risk estimate, and outputting a result of the comparing step as a risk classification index indicating likelihood of future onset of breast cancer.

¹ See, e.g., Figures 4 and 5 and the discussion related thereto in the specification.

² See page 4 of the outstanding Office Action.

However, as apparently admitted by the outstanding Office Action, the '305 patent fails to disclose extracting plural features at multiple scales from a mammogram. In particular, Applicants respectfully submit that the '305 patent fails to disclose extracting, from a selected region of interest in the mammogram, plural surface areas or volumes calculated at corresponding plural scales associated with a texture of a parenchyma of the breast, as recited in amended Claim 1. In this regard, Applicants note that the passages cited by the outstanding Office Action regarding the extracting step in columns 9 and 10 of the '305 patent do not mention fractal-based features, or in particular, surface areas or volumes. The '305 patent mentions fractal dimension only in passing with respect to various prior art studies.³

Further, Applicants respectfully submit that the '305 patent fails to disclose the step of applying the plural surface areas or volumes directly as inputs to at least one of a linear discriminant classifier and an artificial neural network classifier, as recited in amended Claim 1. In this regard, Applicants note that a computing a fractal dimension, for example, by finding the slope of a graph of the log of surface area to log of pixel size is not the same as applying plural surface areas or volumes directly as inputs to a linear discriminant classifier. As shown in the non-limiting example of Figure 4, fractal dimension can be computed by determining the slope of the points in a graph of the log of the surface area to the log of the pixel size. However, Applicants note that Claim 1 requires applying the surface areas of volumes, e.g., the data points in Figure 4, directly as inputs to a linear classifier or a neural network.

The '294 patent is directed to a method for distinguishing and classifying textures of an image in a supervised feature generation system including the steps of obtaining a digitized image file; obtaining texture classification information representative of pixels

³ See, e.g., '305 patent, column 11, lines 33-36.

within the image; computing local area averages for each scale and dependent upon intensity differences and a segmentation map; and computing power log features of the image. In particular, as noted by the outstanding Office Action, the fractal dimension of the image can be obtained using Richardson's law, which is equivalent to finding the slope of the curve in a graph of the log of a major property $M(\epsilon)$ versus the log of ϵ . In particular, Applicants note that, as disclosed in column 8, the '298 patent discloses that such a regression on the log of an area curve versus the log of ϵ is used to find the slope for each pixel, wherein the '294 patent computes such a slope for each area centered around a particular pixel.⁴ Further, the '294 patent discloses that the slope as well as the Y-intercept and the F-test of the regression provide "power log features" for the pixel, which can be used for classification.

However, Applicants respectfully submit that the '294 patent fails to disclose the step of applying plural surface areas or volumes **directly** as inputs to at least one of the linear discriminant classifier and an artificial neural network classifier, as recited in amended Claim 1. Rather, as discussed above, the '294 patent clearly discloses computing the fractal dimension by finding the slope of the log of the area versus the log of ϵ curve for each region centered at a particular pixel. The '294 patent does not disclose applying plural surface areas or volumes directly as inputs to a linear discriminant classifier or an artificial neural network, as required by Claim 1.

Thus, no matter how the teachings of the '305 and '294 patents are combined, the combination does not teach or suggest the step of applying the plural surface areas or volumes directly as inputs to at least one of a linear discriminant classifier and an artificial neural network classifier, as recited in amended Claim 1. Accordingly, Applicants respectfully submit that the rejection of Claim 1 is rendered moot and that Claim 1 patentably defines over any proper combination of the '305 and '294 patents.

⁴ See '294 patent, column 8, lines 9-15.

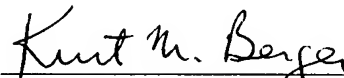
Independent Claims 11 and 21 are directed to a system for computerized analysis of a mammogram and a computer readable medium storing instructions for execution on a computer system, respectively. Further, Applicants note that Claims 11 and 21 recite functional limitations analogous to those recited in Claim 1 and have been amended in a manner analogous to the amendment to Claim 1. In particular, Applicants note that Claims 11 and 21 also recite applying plural surface areas or volumes directly as inputs to at least one of linear discriminant classifier and an artificial neural network classifier. As discussed above, this limitation is not disclosed by any proper combination of the cited references. Accordingly, Applicants respectfully submit that the rejections of Claim 11 and 21 (and all associated dependent claims) are rendered moot by the present amendment to those claims.

Thus, it is respectfully submitted that independent Claims 1, 11, and 21 (and all associated dependent claims) patentably define over any proper combination of the '305 and '294 patents.

Consequently, in view of the present amendment and in light of the above discussion, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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